

Claims

What is claimed is:

1. A predictive load management system, comprising:
  - a power source operable to generate a power output, the power source having a desired operating range;
  - a transmission including a drive member operably connected with the power source and a driven member; and
  - a control system in communication with the power source and the transmission, wherein the control system is operable to receive at least one input indicative of a load on the transmission, to identify a desired load of the transmission based on the at least one input, to receive at least one input indicative of a current power output of the power source, and to limit desired transmission load applied to the driven member of the transmission based on the current power output of the power source to thereby prevent the power source from operating outside of the desired operating range.
2. The predictive load management system of claim 1, wherein the power source is a diesel engine.
3. The predictive load management system of claim 1, wherein the one or more inputs indicative of current power output of the power source include:
  - a power source speed signal;
  - a fuel setting signal; and
  - a fuel injection timing signal.
4. The predictive load management system of claim 1, wherein the transmission is a hydraulic continuously variable transmission including:

a variable displacement pump in communication with the control system;

a variable displacement motor fluidly connected to the variable displacement pump, the variable displacement motor being in communication with the control system; and

a sensor operably disposed between the variable displacement pump and the variable displacement motor, the sensor operable to detect a fluid pressure and to provide an indication of the fluid pressure to the control system.

5. The predictive load management system of claim 4, wherein the at least one input indicative of transmission loading includes at least one of:

- a speed of the variable displacement motor;
- a displacement of the variable displacement motor; and
- a pressure of a fluid in the hydraulic transmission.

6. The predictive load management system of claim 1, wherein the transmission is an electric continuously variable transmission including:

- a generator in communication with the control system; and
- a motor in communication with the control system and with the generator.

7. The predictive load management system of claim 6, wherein the at least one input indicative of the load on the transmission includes:  
a motor output speed; and  
a transmission command torque signal as communicated between the control system and the motor.

8. The predictive load management system of claim 1, wherein the control system includes:

an observer in communication with the power source and operable to determine a current output torque estimate of the power source; and

a controller in communication with the transmission and operable to determine the desired load of the transmission and to limit the the desired load placed on the driven member of the transmission to prevent the power source from operating outside of the desired operating range.

9. The predictive load management system of claim 1, wherein the control system further includes:

a sensor adapted to determine a speed of the power source and to provide a signal indicative of the power source speed; and

a sensor adapted to determine an output speed of the transmission and provide a signal indicative of the transmission output speed.

10. A method of managing a predicted load on a transmission, comprising:

driving a transmission with a power source, the power source having a desired operating range;

estimating a current power output of the power source;

identifying a desired load on the transmission; and

limiting the desired load applied to a driven member of the transmission based on the estimate of the current power output of the power source to prevent the power source from operating outside of the desired operating range.

11. The method of claim 10, including:

sensing a speed of the power source;

sensing power source fuel settings; and

sensing a power source fuel injection timing.

12. The method of claim 10, further including sensing a transmission output torque.

13. The method of claim 10, further including:  
sensing a transmission motor displacement; and  
sensing a transmission fluid pressure.

14. The method of claim 10, further including:  
sensing a transmission motor output speed; and  
determining a limiting motor command signal by comparing the current power source output power estimate with the current transmission output speed and a maximum acceptable speed droop or overspeed scaling factor.

15. The method of claim 14, further including communicating the limiting motor command signal to the driven member of the transmission when the estimated current power of the power source is greater than a predetermined percent of the peak power of the power source and communicating a motor command signal equal to the peak power of the power source divided by the transmission motor output speed when the estimated current power of the power source is less than the predetermined percent of the peak power of the power source.

16. A work machine, comprising:  
a housing;  
a traction device supporting the housing;  
a power source operable to generate a power output, the power source having a desired operating range;  
a transmission including a drive member operably engaged with the power source and a driven member operably connecting the transmission with the traction device, the transmission adapted to transmit the power output of the power source to the traction device; and

a control system in communication with the power source and the transmission, wherein the control system is operable to receive at least one input indicative of a load on the transmission, to identify a desired load on the transmission based on the at least one input, to receive at least one input indicative of a current power output of the power source, and to limit the desired transmission load applied to the driven member of the transmission based on the current power output of the power source to thereby prevent the power source from operating outside of the desired operating range.

17. The work machine as in claim 16, wherein the one or more inputs indicative of current power source performance include:

- a power source speed signal;
- a fuel setting signal; and
- a fuel injection timing signal.

18. The work machine as in claim 16, wherein the transmission is a continuously variable transmission and the one or more inputs indicative of transmission loading include:

- a transmission output speed; and
- a transmission output torque.